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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/825,870	04/05/2001	Leonid Grigorian	052833-5004	3120

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WASHINGTON, DC 20004

EXAMINER

LISH, PETER J

ART UNIT	PAPER NUMBER
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1754

DATE MAILED: 07/22/2003

to

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/825,870

Applicant(s)

GRIGORIAN ET AL.

Examin r

Peter J Lish

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-- Th MAILING DATE of this communication appears on the cov r she t with the corr spond nce address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 May 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Applicant's arguments with respect to claims 1-18 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-4 and 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xu et al. (US 5,973,444).

Xu teaches a process for the growth of carbon nanotubes by the chemical vapor deposition of a carbon-containing gas over a transition metal catalyst. The catalyst material of Xu is preferably selected from iron, nickel, cobalt, and mixtures or alloys thereof. The catalyst support is preferably silica or alumina. The carbon source may be chosen from any hydrocarbon gas, such as methane, ethane, etc. The pressure of the carbon source can be from one millitorr to several atmospheres, either in pure form or in a carrier gas such as argon and nitrogen. The temperature may be controlled within the range between 500 and 1000 °C, however the preferred upper limit is between 700 and 800 °C (columns 7-9). It would have been obvious to one of ordinary skill at the time of invention to use methane gas over an alumina-supported iron catalyst within the temperature and pressure ranges as claimed by applicant, because doing so is seen to be the optimization of a known process, which could have been determined through routine experimentation, and is held to be obvious by *In re Boesch*, 205 USPQ 215.

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Regarding claim 8, Xu does not teach a specific ratio of methane to carrier gas.

However, it would have been obvious to one of ordinary skill at the time of invention to use a gas composition ratio within the range claimed by the applicant because the use of a specific gas mixture ratio is viewed to be the optimization of a known process, held to be obvious by In re Boesch (205 USPQ 215) unless significantly different and unexpected results are shown.

Claims 5 and 9-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xu et al. (US 5,973,444) as applied above and further taken with Resasco et al. (US 6,413,487).

Xu is applied above. Xu does not specifically teach the use of iron-molybdenum catalysts. Resasco, however, teaches that bimetallic catalysts containing at least one of a Group VIII metal, such as Fe or Co, and one of a Group VIb metal, such as Mo, have a synergism which makes them effective catalysts for the production of single-walled carbon nanotubes. Furthermore, a catalyst made up of more than one Group VIII metal and a single Group VIb metal is taught (column 7, lines 28-51). It therefore would be obvious to one of ordinary skill at the time of invention to choose either Fe, Co, or a mixture of the two as the Group VIII metal and to choose Mo as the Group VIb metal.

Regarding claims 5, 10, and 14-16, Resasco teaches that the ratio of the Group VIII metal to the Group VIb metal is preferably from about 1:10 to about 15:1. Further, the total amount of bimetallic catalyst deposited on the support may vary widely, but is generally in an amount of from about 1% to about 20% of the total weight of the metallic catalytic particle (column 8, lines 1-5). Given the teaching of Resasco et al., it would have been obvious to one of ordinary skill at the time of invention to use the claimed ratios of the applicant. Additionally, the use of specific

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catalyst ratios is viewed to be the optimization of a known process, held to be obvious by In re Boesch (205 USPQ 215) unless significantly different and unexpected results are shown.

It would have been obvious to one of ordinary skill at the time of invention to use the catalyst material of Resasco et al. in the process of Xu et al. in order to take advantage of the increased yield of single-walled nanotubes, which perform as high quality field emitters.

Regarding the diameters of the single-walled carbon nanotubes produced by this process. Resasco teaches that the diameter of SWNTs generally varies from 1 nm to 5 nm (column 2, lines 3-6). Additionally, it is expected that the product of the process, as taught by the combination of Xu et al. with Resasco et al., will be identical to that claimed by the applicant.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J Lish whose telephone number is 703-308-1772. The examiner can normally be reached on 9:00-6:00 Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 703-308-3837. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-305-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

PL
July 17, 2003



STUART L. HENDRICKSON
PRIMARY EXAMINER